upon by the atmosphere, or by chemical ingredients held in solution by the waters which it may contain, and the nature of the action determines the result, thus in some instances it remains in its granular state, but assumes a milky whiteness; in others it puts forth crystals from dark granular masses; in others it assumes entirely the crystalline structure. Sometimes these granular bodies are simple, united by the force of cohesion with some common basis or cement, and the whole body is then denominated *sandstone*; at other times, it assumes in aggregate the crystalline structure, and is then known as quartzose rock. Much of the ancient strata exhibits this purity of composition, being wholly composed of pure siliceous bodies, as sands, sandstone, or quartzose rocks, and aggregate masses, and all these several beds owe their origin to the one common mechanical action of sedimentary deposition, their homogeneous nature obliterating all traces, if they ever had any, of stratification. The ejected material of volcanoes has never been known to assume the quartzose structure, nor can we rationally attribute the origin of this material to volcanic causes, for although bodies in cooling down very often assume the crystalline structure, it is not in the nature of silica so to do unless acted upon by those chemical agents which have the power to direct its movements. Thus in metalline beds siliceous bodies are converted into quartz by the same chemical agents, which, by their action, generate the metals, although these agents do not, of themselves, unite with the body. Again, as a bed of clay contracts and opens into fissures, by the gradual loss of its moisture, so silica separating from the clay, assumes the quartzose form, its crystals increasing in size by constant depositions of silicic acid, in the same manner as stalactites increase in cavernous appertures of the earth. Again, flints, as we behold them, are solid bodies, but all of them contain earths in variable proportions, and therefore when these flints become exposed to long continuous tropical heat, united with moisture, chemical action is produced within the stone, gradually extending from the exterior to the circumference, the earths or metalline bodies are abstracted, or the latter, chemically acting with the silica, causes it to assume the quartzose form; these, and innumerable other means, may be adduced whereby nature forms quartz, which is the chief ingredient of almost all the crystalline rocks.

(To be continued.)

METROPOLITAN IMPROVEMENTS.

(Continued from p. 242.)

To the inquiries of the commission as to the best mode of improving the navigation of the river, with reference to the trade of the locality, and assuming proximate uniformity of width to be desirable for such improvements, Mr. Hartley observes, "I am of opinion, that approximate uniformity of width is desirable for the purpose mentioned, and I conceive this may be obtained without injury to the trade of the locality, by leaving open the spaces between the embankment and the shore for the use of those now occupying the margin of the river." Mr. Gordon—that "as in order to regulate the river, it should be brought to approximate uniformity of width, the best mode of accomplishing this, with reference to the convenience of trade, would be the principle of the plan B, whereby the present river fronts remain intact, and, all things considered, the craft would have better and safer accommodation than at present." Mr. Rendel—that "the local trade would be best consulted by leaving the space between the wharf and the embankment open to the tidal flow and ebb." And Mr. Macneil —that "the best mode of accomplishing the object, having reference to the trade of the same localities, will be to construct a wharf wall sufficiently wide to form a thoroughfare upon it, and at such a distance from the shore as to allow barges and other craft to ply to the different wharfs, as at present upon the principle of plan B." In Mr. Cubitt's judgment, on the other hand, "the better mode would be to construct the shores of the river with strong walls, and to form floating docks between such walls and the present shores, and wharfs for the accommodation of the trade." The opinions of Captain Beaufort, Mr. Rennie, and Mr. Giles are not directly expressed on the point, and are consequently not available.

To a subsequent question, whether the principle of plan B would be better carried out by the substitution of locks and floating basins for tidal docks or side channels, as originally proposed, the replies of Mr. Cubitt, Mr. Rendel, Mr. Rennie, and Mr. Giles, were in the affirmative; of Mr. Hartley, Mr. Gordon, and Mr. Macneil, in the negative. In the series of questions submitted to the Hydrographer to the Admiralty this question was inadvertently admitted.

We think it right, in reference to this point of our inquiries, to advert to the distinct and practical testimony of Captain Maughan. "Side channels," he observes, "admitting the rise and fall of the tide, would, in my opinion, be preferable to docks. The former appear to possess advantages over the latter plan, viz. access for the barges at all times of the tide (at least as long as there is water inside the terraces), the saving of a very considerable expense in constructing locks, double lock gates, &c., as also the usual cost of maintenance, and of the establishments for working them. Locks would also very much encroach upon the side channels, and, if many of them should be required for the admission of barges, the annual cost would be very heavy indeed."

He adds, "If the side channels were converted into floating basins, the abstraction of tidal water would of course be equal to the cubic contents of these docks; and so far as the navigation is concerned, this modification of Mr. Page's plan would be as injurious as a solid embankment."

The next in the series of considerations connected with Mr. Page's plan are the alleged difficulties of entrance to these side channels from the river. The number, position, and dimensions of these, it is obvious, might be modified at almost any period previously to the commencement of the works, and we confined ourselves, therefore, to points less susceptible of modification. Mr. Hay, a lighterman, observes, "I think Mr. Page's plan is the best I have seen, and if a project of that kind is to be executed, I have never seen any plan equal to it; but if the river is narrowed, the tide will go up with greater velocity. We have great difficulty, now, in bringing up with our craft. Now we can bring up to the wharfs, and bring up in a recess, and get out of the way; but I doubt whether we can ever bring up at all when the tide is running so hard as it would. Still Mr. Page's plan is a very excellent one; I have seen nothing equal to it, if these difficulties of getting in at the openings can be done away with." On being further questioned whether his objections would equally apply to open entrances, he replied, "If there is a plan intended to be carried into effect on the river, there cannot be a better; but I fear when we come to the openings the tide will carry us by." Mr. Lucey, also a lighterman apprehended no difficulty whatever; referring to the entrances of London and St. Katherine's Docks, he depended upon the eddy to assist him, and gave his reasons for that dependence. Mr. Tayler thought there would be no difficulty "unless the speed of the tide were very much increased. In the flow of the tide it would then require some very experienced bargemen to bring up, and ring-bolts or piles must be resorted to for the purpose." Assuming an increase of 15 per cent. upon a velocity of three miles an hour, he anticipated no difficulty whatever. Mr. Harvey had conversed with intelligent lightermen, and inferred, from the same causes, that admission would be more difficult. Mr. Pocock adverted to the increase of existing difficulties since the removal of Old London Bridge, and was also of that opinion, attaching little importance to the drift or eddy anticipated by Mr. Lucey; and Mr. Peache, referring to the fact that a great portion of the craft were worked by only one man, considered that there would be difficulty, in such cases, in getting in without further assistance.

On this point it is observed by Captain Beaufort, "the entrance to the docks in plan B would be often difficult when the tide might be strong; and, if these entrances were converted into locks, great inconvenience would probably arise from several barges arriving at the same time. At the docks which are used by large vessels, specific times of the tide are selected for letting vessels in, and they are then attended by a sufficient number of men to overcome all difficulties; whereas a barge is moved about the river by a single man, who would be quite incapable of conducting her into a narrow gate or lock."

Looking to this question as one having rather a practical than scientific bearing, the opinions of the engineers consulted were, perhaps, not unexpectedly discordant. Mr. Hartley and Mr. Cubitt disapproving of the particular entrances shewn in plan B, were nevertheless of opinion that there would be no difficulty in designing entrances such as should afford entire protection against strong currents and high winds; the first, however, saw no necessity for locks, the second admitted locks in deep recesses. Mr. Gordon also was of opinion that there would be no difficulty, thought the gates in the plan "judiciously placed," and recommended the addition of others. Mr. Rennie, observing that "all the entrances to the various docks at present on the river are occasionally affected by currents and high winds," assumed that "a careful observation of the prevailing winds would determine their position;" Mr. Giles, that "they would be affected by the same causes, but that these would not impose greater difficulties than exist at the entrances of the various docks on the river, and which might, by the means resorted to in these cases, be overcome."—On the other hand, Mr. Macneil was of opinion, that "these entrances would impose difficulties and obstructions such as do not now exist at the entrances to the various docks or wharfs on the river; and Mr. Rendel, "that they would be difficult, if not dangerous, except for an hour and a half, at most, before and after high and low water."

The experience of Captain Maughan may here be again of service in elucidating a practical question. To questions whether the entrances should be at right angles with the stream, he replied "As regards facility of entrance, I think that is of very little importance. The craft will have to stop outside first of all, and, if there is no tide, which I apprehend there will not be, close to the embankment wall, they will go in as they like; I do not think the stream will run rapidly close to the terrace, so as to prevent the easy ingress of barges." He apprehended no difficulty in getting in, no pressure of the tide upon the vessels at the entrances. In his letter he observes, "The difficulties which have been raised about entrances at right angles I confess I cannot understand; they appear to me very much exaggerated. With a floating platform or dumb-lighter, and piles driven down at proper distances to check the barges, any lighterman could pass in his craft, even should the stream run up rapidly outside, but which I very much doubt its doing, as stated in my evidence."

The discussion of these entrances, without reference to the principle involved in the one or other of the modes of appropriation already suggested, involved a further consideration of some difficulty. The sufficiency of their width was generally admitted, but their height above high-water mark, assuming moveable bridges to be dispensed with, afforded subject for much difference of opinion. Mr. Tayler and Mr. Pocock considered, as coal-merchants, that from six to eight feet headway would be sufficient for their purposes; but for straw barges, and other descriptions of craft engaged in similar traffic, and, in short, for general uses, Mr. Hay regarded 10; Mr. Lucey, 11; Mr. Peache, 12; Mr. Tayler, 14 or 15; and Mr. Harvey, 30 feet, as the smallest allowable reservation. The diversity of opinion upon such a point, between parties whose interests and daily habits should make them conversant with these details, is sufficient, we think, to justify a doubt as to the reasonableness of some of these requisitions.

As the object of any measure for the improvement of the river should be obviously to get rid of the mud at present accumulated upon its shores, the attention both of Mr. Walker and Mr. Page had, of course, been directed to these points: Mr. Walker trusted chiefly to the inclination of his recesses towards the river, and to the tide in cleansing them; Mr. Page, to an inclination to be artificially given in the first instance, and to the subsequent operation of culverts and sluices.

The relative advantages of, and objections to, Mr. Walker's recesses in regard to this